EFFECT OF OLEO CHEMICAL WASTE AS PARTIAL SAND REPLACEMENT IN SAND BRICK

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Kajian ini membentangkan penggunaan sisa kimia oleo sebagai pengganti pasir separa dalam bata pasir. Disebabkan pertumbuhan dari segi pembangunan industri pembinaan, permintaan bahan binaan seperti bata dan bahan pasir lebih tinggi. Bata memainkan peranan penting dalam pembinaan sebagai alternatif batu dan dibentuk dalam pelbagai kelas, jenis, bahan dan saiz dalam jumlah besar yang berlainan dalam tempoh masa dan rantau. Penggunaan pasir menjadi tidak terkawal dan menyebabkan peningkatan perlombongan pasir. Aktiviti ini menyebabkan kemusnahan alam sekitar. Oleh itu, mencipta keperluan untuk bahan pembangunan dengan penggunaan sisa yang sesuai. Bata batu adalah salah satu bahan bangunan yang sangat digunakan dalam pembinaan. Penggunaan bahan buangan di dalam batu pasir dapat mengurangkan penggunaan pasir yang berlebihan dan mengurangkan beban alam sekitar. Sisa kimia Oleo yang dikumpulkan ialah dari Industri Kimia Oleo yang memproses minyak sawit. Walau bagaimanapun, ia juga menghasilkan banyak sisa. Apabila sisa dari kilang dikeluarkan, ia akan dibuang dan diletakkan di tempat pembuangan sampah. Untuk mengelakkan tapak pelupusan penuh dengan sisa, ia boleh digunakan untuk penyelesaian yang lebih baik iaitu dengan menggantikan sisa dengan bahan yang digunakan untuk tujuan pembinaan. Selain itu, tiada kajian telah dilakukan mengenai penggantian sisa kimia oleo dalam bata untuk bahan binaan. Kajian ini akan mengkaji kesan sisa kimia oleo sebagai pengganti pasir separa dalam bata pasir. Sisa kimia oleo dibahagikan kepada 0%, 5% dan 10% terhadap peratus berat pasir. Sisa kimia oleo akan dikeringkan dan mengisar dengan lancar sebelum digunakan untuk penggantian pasir. Tiga ujian yang berbeza yang menguji kekuatan mampatan, ujian kekuatan lentur dan ujian penyerapan air dijalankan untuk menguji prestasi bata pasir dengan tingkat penggantian yang berbeza dari sisa kimia oleo pada usia 7 dan 28 hari. Hasil dan perbincangan diperiksa dan direkodkan untuk keputusan analisis.

ABSTRACT

This paper presents about the utilization of oleo chemical waste as a partial sand replacement in sand brick. Due to the growth in terms of development of construction industry, demand of construction material such as brick and material of sand are higher. Brick plays important role in construction as an alternatives of stones and are formed in various classes, types, materials and sizes in large quantity which different in time period and region. The used of sand become uncontrolled and lead to the increasing of sand mining. This activity caused the destruction in environment. Thus created a need for the development material with a suitable utilization of waste. Sand brick is one of building material that highly used in construction. The used of waste materials in sand bricks can lessen the excessive used of sand and reduce the environmental burden. Oleo chemical waste collected from the Oleo Chemical Industry that processing palm oil. However, it also produces a lot of waste. When the waste from factory released, it will be thrown and placed at the landfills. For avoiding landfills full with the waste, it can be used for a better solution which is by replace the waste with material that used for construction purpose. Moreover, no research have done about replacement of oleo chemical waste in bricks for construction materials. This research will investigate the effect of oleo chemical waste as a partial sand replacement in sand brick. The oleo chemical waste are divided into 0%, 5% and 10% of replacement to the percentage weight of the sand. The oleo chemical waste will be dried and grind smoothly before it use for the sand replacement. Three different test which compressive strength test, flexural strength test and water absorption test be conduct to test the performance of the sand brick with different replacement level of oleo chemical waste at age 7^{th} and 28^{th} days. The results and discussions examined and recorded for result of analysis.

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LIST OF ABBREVIATIONS

FAME	Fatty Acids Methyl Ester
JKR	Jabatan Kerja Raya
OPC	Ordinary Portland cement
CaO	Calcium Oxide
SiO_2	Silicon Dioxide
Al_2O_3	Aluminium Trioxide
Fe_2O_3	Iron Trioxide
MgO	Magnesium Oxide
SO_3	Sulphur Trioxide
DPMS	Deinking Paper Mill Sludge
MS	Malaysian Standard
FKASA	Fakulti Kejuruteraan Awam & Sumber Alam
CSH	Calcium Silicate Hydrate

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Brick is small units building material used to make pavements, walls and other elements in construction. Bricks are strong and lasting building material. In Malaysia, generally brick plays important role in construction as an alternatives of stones and are formed in various classes, types, materials and sizes in large quantity which different in time period and region. Highly economical cost, superior finish as well as high compressive strength and durability (Gupta, Attri and Kumar, 2015). Bricks can be composed of sand, cement, water and stick like a bond that secured with mortar to hold the bricks together to make a strong and durable structure.

Sand is natural resources and an important substance that is used in manufactured of concrete and brick. The function sand is to provide bulk and strength to construction materials. Sand mining is the separation of sand from an open pit yet occasionally the sand is mined from beaches, riverbeds and inland dunes from ocean. Sand mining cause to destruction of environment. Environmental problems occur when the rate of extraction of sand, gravel and other materials exceed the rate at which natural processes generate this materials (Ashraf *et al.*, 2011). Until recently, sand has been mined predominantly from land quarries and riverbeds but due to intensive exploitation and because of this practise have been banned in many regions and environmental regulations have become much more strict (Dan Gavriletea, 2017).

In sand replacement, industrial waste used to be a partial replacement in production of brick. The waste which is oleo chemical waste are used to replace the sand partially in the mix proportion. The oleo chemicals are chemicals that been produced from the palm oil. The processed of the palm oil is obtained by extracting the pulp of the palm fruit. Palm oil is reacting in form of triglycerides with vary composition of the alky chains. Fatty acids, fatty acid methyl esters (FAME), fatty alcohols, fatty amines and glycerol are the basic formation of oleo chemical substances. The production of oleo chemical used for making soaps, detergents, lubricants, solvents, bioplastics and biodiesel (Rupilius and Ahmad, 2005). In oleo chemical industry, the industrial process waste need to be treated before discharged even the material are considered to be environment friendly. When the waste from factory released, it will be thrown and placed at the landfills. For avoiding landfills full with the waste, it can be used for a better solution which is by replace the waste with material that used for construction purpose.

1.2 Problem Statement

Sand brick are widely used in construction in Malaysia because it is easy to make it and not expensive to be produced. However, the use of natural sources such as sand are difficult to find especially for the manufactures to locate the suitable places for the natural aggregate supply. Due to the shortage of the natural sources, it is affect the pricing of the sand brick and the price of the sand. Next, the more excessive used of sand also causes the activities of sand mining continued. Sand mining will cause to destruction of environment and give impacts to the wildlife. Besides, the extraction of sand can cause the disturbance of underwater and coastal sand which can causes the turbidity in the water. The ecosystems of aquatic life will be disrupted and the flow of river become deeper due to the sand mining.

1.3 Objectives of the Study

The aim of this research is to test the potential of using oleo chemical waste as partial sand replacement in sand brick. The objectives of this study are:

I. To investigate the compressive strength of sand brick with the effect of oleo chemical waste as partial sand replacement.
II. To determine the flexural strength of sand brick with the effect of oleo chemical waste as partial sand replacement.
III. To study the water absorption of sand brick with the effect of oleo chemical waste as partial sand replacement.

1.4 Scope of the Study

The scope of this research are:

I. The sample of sludge is taken from FPG Oleo chemical industry at Gebeng, Pahang.
II. For the mix design, the sludge divided into 0%, 5% and 10% to replace the percentage weight of sand.
III. For the testing, compressive strength test, flexural strength test and water absorption test will be conducted to check the effect of sample with sand replacement.
IV. The testing will be handled at laboratory at Universiti Malaysia Pahang (UMP).
V. For the compressive and flexural, the test will be conducted on 7^{th} and 28^{th} days and will be according to ASTM.
VI. The water absorption test will according to JKR standard 2014.
VII. The size of mould for a brick is 113mm x 225mm x 75mm (W x L x H) according to JKR standard 2014.
VIII. The mix design and non-load bearing for a brick will be according to JKR standard 2014.

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